Interaction matters: Strategies to promote engaged learning in an online introductory nutrition course

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Abstract

Fostering interaction in the online classroom is an important consideration in ensuring that students actively create their own knowledge and reach a high level of achievement in science courses. This study focuses on fostering interaction in an online introductory nutrition course offered in a public institution of higher education in Hawai'i, USA. Interactive features included synchronous discussions and polls in scheduled sessions, and social media tools for sharing of information and resources. Qualitative student feedback was solicited regarding the new course features. Findings indicated that students who attended monthly synchronous sessions valued live interaction with peers and the instructor. Issues identified included technical difficulties during synchronous sessions, lack of participation on the part of fellow students in discussion and inability to attend synchronous sessions due to scheduling conflicts. In addition, few students made use of the opportunity to interact via social media. While students indicated that the interactive components of the course were valuable, several areas in which improvement may be made remain. Future studies may explore potential solutions to issues identified with new features to further promote interaction and foster learning in the course. Recommendations for instructors who are interested in offering online science courses in higher education are provided.

Key words: Student engagement, synchronous communication, E-learning, education, nutrition

Introduction

Engaged learning, or learning that is instructor facilitated and student focused, is a topic of importance in today's learning environment, which increasingly incorporates technology to facilitate the knowledge construction process. The importance of engaged learning has been emphasized for many years by a number of learning theorists, who underscored the idea that students learn most effectively through operating jointly and engaging in discussion with fellow learners (Bornstein & Brunner, 1989; Piaget, 1969; Vygotsky, 1981). Learner engagement has been found to be linked positively to desirable learning outcomes such as critical thinking and higher grades (Carini, Kuh, & Klein, 2006). As student engagement is developed through interaction (Anderson, 2003), fostering interaction in the classroom is an important consideration in ensuring that students actively create their own knowledge and reach a high level of achievement.

In online courses, in which learner isolation and dropout is more likely to be an issue, interaction is a key component of fostering learning (Conrad & Donaldson, 2004). Although content may have been the main focus of online courses in the past (Nipper, 1989), interaction is now recognized as playing a crucial role in stimulating learning (Bernard et al. 2009; Lou, Bernard, & Abrami, 2006; Norris, Mason, & Lefrere, 2003). Activities that involve collaboration and sharing of ideas among students promote a deeper level of thought and create meaning for the learner (Conrad & Donaldson, 2004). Previous studies have identified three types of interaction that have been shown to support learning in online courses: 1) interaction with content, including the ability of learners to access, manipulate, synthesize, and communicate content information; 2) interaction with instructors, or the ability of learners to communicate with and receive feedback from their instructors; and 3) interaction with classmates, such as the ability of learners to communicate with each other about content to create an active learning community (Bernard et al., 2009; Moore, 1989).

In creating the most effective learning environment in distance education courses, course features that encourage the three key types of interaction must be selected. Student-content interaction may take on a number of forms, including watching instructional videos, interacting with multimedia, as well as searching for information (Abrami et al., 2011). To create a vibrant online community, instructors must facilitate sustained engagement with course material and use specially tailored assignments (Hege, 2011). With regards to student-instructor interaction, the social presence of the instructor is an integral component of a successful online course; the instructor must perform activities that translate virtual interaction into an impression of a "real" person (Dixson, 2012; Kehrwald, 2008). To interact with students, instructors may incorporate both synchronous activities such as telephone correspondence, and asynchronous, such as e-mail messages (Abrami et al., 2011). Similarly, to foster student-student interaction, synchronous activities, as in videoconferencing or chatting, or asynchronous, as in discussion boards (Abrami et al., 2011), may be performed. Social media, which refers to technological systems promoting collaboration and community (Joosten, 2012), is another tool that may be used to encourage interaction among students. Social networking sites, such as Facebook and Twitter, are now used widely among college students and have been employed as learning tools in the online classroom (Tess, 2013). A number of previous studies have indicated positive effects of online social networking on learning. In a study investigating the learning impacts of online social networking on university students, Yu and authors (2010) found that this type of interaction not only directly affected learning outcomes, but also helped the students attain social acceptance from others, and adapt to university culture, which play an important role in improving learning outcomes (Yu et al., 2010). Social media has become increasingly popular in enhancing communication among college students studying a variety of subjects; for example, a recent study reports on the use of social media in an introductory statistics course (Everson, Gundlach, & Miller, 2013). The authors point to the importance of meeting students where they are with regards to use of technology, and suggest that social media may be used as a way of encouraging students to participate in their learning experiences (Everson, Gundlach, & Miller, 2013). As previous studies have demonstrated that small group rather than individual learning has significantly more positive effects on student achievement (Lou, Abrami, & d' Apollonia, 2001), student-student interaction is particularly important to promote in the online environment. Research on all three modes of interaction, however, has shown that each one favorably impacts student achievement (Bernard et al., 2009).

Use of diverse techniques to foster interaction is a critical component of delivering material in undergraduate science courses, which are now being taught online to a greater degree than in the past.

In the fall semester of 2011, the University of Hawai'i at Mānoa (UHM) offered its first online introductory nutrition course, which was subsequently offered every following semester. Course content was presented in both synchronous and asynchronous format. The main course component allowing for interaction was four mandatory synchronous sessions during the semester. During these synchronous sessions, a variety of activities were included, such as group presentations addressing various course topics. While students taking the course in fall 2012 and spring 2013 indicated in qualitative reviews of the course that synchronous sessions were useful, a desire for increased participation in the sessions on the part of the students was expressed, as well as group discussion and possibilities to interact with peers through other avenues outside of sessions. Based on this feedback, additional course features were designed and incorporated to further foster interaction in fall 2013. The objective of the current research was to evaluate these new features in the online introductory nutrition course. Based on student feedback on the new interactive components, suggestions for components to retain as well as possible improvements are made. Additionally, recommendations based on the current research are provided for instructors interested in offering online science courses in higher education.

Methods

This study used a three-stage qualitative procedure to foster interaction: 1) Issue identification; 2) Strategy implementation; and 3) Feedback solicitation. Table 1 summarizes the three stages. The protocol was approved by the Institutional Review Board of the UHM.

Table 1.
Three-stage qualitative procedure used to foster interaction in an online introductory nutrition course outlined by stage, task, and semester implemented

Stages	Tasks	Semester Implementation
Stage 1: Issue identification and Strategy Proposal	Review of student feedback from previous semesters during which the online nutrition course was offered Identification of pedagogical strategies to address issues identified	Fall 2012 and Spring 2013
Stage 2: Strategy implementation	Implement selected pedagogical strategies	Fall 2013
Stage 3: Feedback solicitation	Solicit qualitative student feedback in response to the new course features	Fall 2013

During the 2012-2013 academic year, the online introductory nutrition course was offered once per semester. The course content was presented asynchronously in the form of weekly modules available through the course site on Laulima, a Sakai-based learning management system used throughout the UHM system. Weekly modules included recorded lectures and review activities that students could complete independently and at their own pace, as well as videos from external website, readings from external website and textbook reading assignments. Students were required to participate in weekly discussions online with set deadlines, which involved responding to a question posed by the instructor related to the content of the week's module. Students were also required to complete weekly quizzes with set deadlines, as well as two midterm examinations and a final. Each semester, four synchronous sessions using the Blackboard Collaborate system, a web conferencing tool, were also integrated into the course to allow for live interaction online. During each session, students, who had been previously assigned to work in a group on a specific topic, gave presentations to the instructor and their peers. Of note, this course was listed in the schedule of classes as an asynchronous class, with no set class meeting date or time. The designated day/time for synchronous sessions, which was the same day of the week and same time for each session, was indicated on the course syllabus. As a result, although these synchronous sessions were mandatory, some students had a scheduling conflict at the time of the

sessions, resulting in not all students being able to attend. Those who were not able to attend were offered an alternate assignment to complete. Upon conclusion of each session, recordings were shared on the course site for viewing. To obtain feedback on the course content and setup, students were asked to complete a course evaluation midway through the course, as well as at the end of the semester.

A. Issue identification and strategy proposal

To identify any issues related to the synchronous sessions as the main course component allowing for interaction with classmates and the instructor, teaching evaluations from fall 2012 and spring 2013 were reviewed for comments specific to the synchronous sessions. There were 66 respondents to the fall 2012 evaluations, and 23 respondents in spring 2013. Responses to the following item were examined: "Please list your suggestions for improving the course and/or the instructor's teaching style and methods." All responses to this item related to the synchronous sessions were compiled. In fall 2012, 19 students provided suggestions in response to this item, and there were four comments specific to the synchronous sessions, with three of these stating that more synchronous sessions would improve the course. In spring 2013, 11 students provided suggestions in response to this item, and there were seven comments specific to the synchronous sessions, with five of these suggesting changes to the activities during the synchronous sessions, including fostering greater interaction. The following issues were pinpointed: 1) Students expressed the desire for greater direct participation during the sessions; and 2) Students suggested including alternate ways of promoting interaction other than group presentations. To address these difficulties, students made the following specific suggestions: 1) Use available web conferencing tools for group discussion during the synchronous sessions to encourage peer participation; 2) Eliminate group work, and find other ways to make class interactive; and 3) Create an online forum for ongoing discussion that is always available to see what peers have to say about course topics and assignments—unlike a synchronous session, which only occurs at certain times.

B. Strategy Implementation

To adapt the course to further foster interaction in response to student comments from the 2012 – 2013 academic year, six strategies were identified and implemented in the online introductory course offered during the fall 2013 semester. First, rather than requesting that students give presentations in groups during the synchronous sessions, session agendas were altered to include small group discussion sessions utilizing online breakout rooms and a brief instructor-led review session employing polling tools. Second, to help students gain familiarity with the live web conferencing tool, a brief review of how to interact in the online environment was added at the start of each session. This review included an overview of how to use the icons displayed in the Blackboard Collaborate system, such as the chat box, the whiteboard, and the microphone. Students were encouraged to make use of all of these tools to communicate and interact during synchronous sessions. Third, following this review, polling questions related to the content of the week were posed that required students to respond to multiple choice or true/false items as a class, as well as discussion questions that students first addressed in breakout rooms with three to four students per room, and then as a class. Forth, during the discussion in breakout rooms, the instructor moved between rooms to stimulate discussion and listen to points raised. Fifth, those who were not able to attend the session had the option of completing an alternate assignment for credit, which involved composing a one-page response to a question related to the content of the synchronous session. Lastly, a course Facebook group was created to provide students with an outlet for interaction outside of the designated class times. Students were encouraged to become members of the group and to use it to share resources related to the course and interact with fellow students and the instructor. On a weekly basis, the instructor posted news articles and information related to course content on the group's homepage.

C. Feedback solicitation

To obtain student comments on the new interactive course features, students completed an online survey using surveymonkey.com at the end of each synchronous session. The survey collected feedback on: 1) aspects of the session that helped students to participate and/or learn; 2) if there was anything about the session that made it difficult to participate and/or learn; 3) suggestions for improving the session. Survey responses were reviewed after each session. Student comments after the first session reflected two issues that could easily be addressed to improve subsequent sessions: 1) Six of the 18 respondents to the survey (33%) mentioned technical difficulties, including computers running slowly and crashing at

times; and 2) One student noted that groups were not able to view discussion questions posed for small group discussion in breakout rooms. In response, two changes were made in the following sessions: 1) IT support person requested to be available for students accessing the session in the computer lab to assist with any technical difficulties; and 2) discussion questions for small group discussion made visible in breakout rooms for students to reference during discussion, rather than only in the main room prior to division into small groups.

Students were also asked to complete a mid-semester survey administered via the Laulima system in week 8 of the semester. Survey items included: 1) what aspects of the course students liked the best; 2) what aspects of the course students liked the least; 3) suggestions for improvements to the course. Finally, students also completed an end-of-semester course evaluation via eCAFE, the UHM's electronic course evaluation system. This included the following items: 1) what aspects of the course students liked the best; 2) what aspects of the course students liked the least; 3) suggestions for improvements to the course. All survey responses were anonymous and no incentives were provided for completion of the surveys.

Results

A. Student demographics

Student demographics are presented in Table 2. Very few freshmen were enrolled in the course, and approximately 60% of the students in the course were male. Students came from a variety of disciplines as this course counts toward the general education Diversification Biological Science credit requirement.

Table 2.
Demographic characteristics of students enrolled in an online introductory nutrition course (n=56)

Major	Number	%
KRS, Hlth/Exer Sci & Lifest Mg[a]	8	14
Business	7	12.5
Pre-Nursing/Nursing	6	11
Family Resources	6	11
Engineering	2	4
Travel Industry Management	1	2
Education	1	2
Other—Natural Sciences	3	5
Other—Arts & Humanities	3	5
Other—Social Science	12	21
Undeclared	7	12.5
Class Standing		
Freshman	2	4
Sophomore	19	34
Junior	17	30
Senior	18	32

[a] Kinesiology & Rehabilitation Science, Health, Exercise Science & Lifestyle Management

B. Survey Results

While there were 56 students enrolled in the course, not all attended the synchronous sessions due to scheduling conflicts or other reasons. The number of session attendees and of respondents to the surveys at each session is indicated in Table 3. The number of respondents to the surveys after the four sessions ranged from eight to 18.

Table 3.
Number of attendees in synchronous sessions and respondents to surveys conducted mid-semester and post-synchronous sessions in an online introductory nutrition course

Survey	Week of Course	Number of Attendees	Number of Respondents
Session 1 Survey	2	22	18
Session 2 Survey	6	15	14
Session 3 Survey	10	13	12
Session 4 Survey	14	9	8
Week 8 Survey	8	Sent to entire class	44
End-of-semester Evaluation	15	Sent to entire class	46

Selected responses that represent the general findings of each of the four session surveys are presented in Table 4. In reviewing the aspects of the sessions that helped them to participate/learn, respondents mentioned the group discussion that was conducted in breakout rooms and as a class a number of times. The ability to communicate verbally with fellow students and the instructor, and to communicate in written format using the chat box and whiteboard were also cited. Results indicated that students who engaged in the interactive components of the course valued live interaction with peers and instructor. Students not only liked to be able to discuss in groups with their peers, but also to interact using polling, and to hear the instructor's voice. In terms of factors that hindered participation/learning, some respondents mentioned technical difficulties such as losing Internet connection, or experiencing delays due to the connection, as well as lack of participation on the part of fellow students during group discussion. With regards to student participation, comments highlighted that there was often a lack of response from others in the breakout rooms and periods of silence, and in some cases only one or two students participated in the group discussion as a class. When asked to provide suggestions for improving the sessions, responses after the first session reflected the technical difficulties in the computer lab. After technical support was put into place, most respondents stated that they did not have any recommendations for changes to be made at the end of the last three sessions. The few suggestions that were provided after each of the last three sessions included increasing student participation, shortening the sessions, and increasing the number of polling questions.

Table 4.
Selected responses from surveys after synchronous sessions in an online introductory nutrition course

Survey Number	Survey Items		
	What aspects of the session helped you to participate and/or learn?	Was there anything about the session that made it difficult to participate and/or learn?	What suggestions do you have for improving this session?
	Selected Responses		
Session 1 Survey	*The collaborative aspect is very helpful. I liked that we got to talk to other students and the professor.* *The microphone and the chat was really helpful for me, and having our teacher there actually talking was nice.*	*The session froze on me so I had to exit and enter again during the discussion time and missed out on part of the discussion.* *The computer kept crashing and it was so slow.*	*I would rather type in the chat box than have to speak.* *More participation.*
Session 2 Survey	*Being put in groups to discuss questions and hear other people's opinions.*	*Something that was difficult was to wait for other people in your group to respond to what you post or say. Some people don't want to respond and just want to sit around and listen.*	*So far everything is easy to access.* *More participation.*
Session 3 Survey	*Discussion questions helped me go into specific details about vitamin deficiencies and gave me the chance to participate with my classmates.* *Group work and polls are very helpful.*	*Breakout sessions. Some of my members were not participating.* *When my wifi stopped working a few times it made me a little confused as I missed getting put into a group during a breakout session.*	*Nothing. This session was great! Even better than the last one.* *More! I enjoyed this session.*
Session 4 Survey	*Being able to communicate with my fellow classmates. The professor gave feedback herself about the discussion topics.*	*Only about two of us participated in the main room discussion.*	*More participation from students in the discussion.*

Similar comments were found in the week 8 survey with regards to the interactive components of the course. When asked what aspects of the course students liked the best, four (9%, n=44) students mentioned the course components that involved interaction with peers and the instructor. These included the responsiveness of the instructor to e-mail inquiries, the weekly discussion posts required, and the synchronous sessions. This relatively low number of comments related to interaction could be a result of several possible factors: students valued other factors to a greater degree, students selected a course with no scheduled time, expecting a completely asynchronous class with less interaction, or many students simply did not participant in live sessions. Fifteen (34%) students mentioned the flexibility and/or convenience of the class in terms of being able to complete assignments at their own pace in a location of their choosing, and nine (20%) mentioned the applicability of the material to real life. In terms of aspects of the course students liked the least, five (11%) students made comments related to interaction in the course. Of these, two students mentioned scheduling conflicts that prevented attendance at synchronous sessions, two stated that there were not enough opportunities for interaction, and one mentioned lack of participation on the part of fellow students during group discussion. With regards to suggestions related to the interactive components of the course, three (7%) students suggested having more opportunities for

discussion, two (5%) students suggested scheduling synchronous sessions to accommodate student schedules, and one (2%) student mentioned shortening the session. Selected responses representing the general findings of the week 8 survey are presented in Table 5.

Table 5.

Selected responses from week 8 survey in an online introductory nutrition course

Survey item	Selected responses
What do you like best about this course?	*I feel like I'm learning and with the discussion posts its fairly interactive for being an online course.* *I like the weekly discussions and sessions that we have as a class because it gives this distance education course the chance to actually interact with my fellow classmates. I also like that even though this is a DE course I can still receive the help that I need from the professor.* *I like that this course is online. I have the power of when I can work on the assignments and study each module.* *Knowing what types of foods that I need to eat more and less of is exceptionally important to me and this course helps me to decide that and choose what nutrients I need.*
What do you like least about this course?	*I would have to say the sessions that we have to do on line. I feel that they are sometimes counterproductive because not everyone participates when we are discussing. Sometimes when we break into groups only one person will discuss the question.* *There is not much interaction between my peers since it is an online class. I tend to be more engaged in a subject when I am around my peers.* *I think that what I like least is not being able to attend synchronous sessions*
Please give suggestions on improvements for this course.	*More supplements, active discussions, etc. to engage people in the online course.* *Easier quizzes and shorter synchronous sessions.* *Have more synchronous sessions. I feel that I learned a lot in the last one.*

Table 6 presents the results of the end-of-semester evaluation. While there were 46 students who responded to the survey in total, not all responded to the open-ended questions posed. When asked what aspects of the course students liked the best, 11 out of 36 respondents (31%) mentioned the course components that involved interaction with peers and the instructor, an increase from the week 8 survey. These included the ability to present their opinion on various topics and respond to peers using the discussion board, and verbally communicating in synchronous sessions. Ten (28%) cited the flexibility of the online course in terms of completing work when desired, and three (8%) mentioned the applicability of concepts to real life. In terms of aspects of the course students liked the least, eight out of 37 respondents (22%) made comments related to interaction in the course, mainly related to the synchronous sessions. Twelve (32%) mentioned the tests and/or quizzes, and eight (22%) stated "nothing" or "N/A" in response to this item. In terms of suggestions for course improvement, eight out of 35 responses (23%) were related to interactive components of the course, and mainly focused on

scheduling of synchronous sessions to fit student schedules and sending reminders using the Facebook page.

Table 6.

Selected responses from end-of-semester evaluation in an online introductory nutrition course

Survey item	Selected responses
Which aspects of the course did you like the best?	*I really liked the discussion boards. It was interesting to see how other people reacted to the questions.* *That it was online and I didn't need to attend an actual class…I could be at my desk in my office at work and work on this course when I have free time.* *The course helped me to prepare my meal plans for the upcoming bodybuilding competition that I'm going to compete in next year.*
Which aspects of the course did you like the least?	*Not able to join synchronous sessions.* *Some material on exams and quizzes was not in the provided online lessons.*
Please list your suggestions for improving the course and/or the instructor's teaching style and methods.	*The synchronous sessions should be offered at other times instead of just one specific time.* *Some emailed reminders or updates on the Facebook page about deadlines from assignments or projects would be helpful.*

Only eight students joined the course Facebook group, and no students created posts on the homepage or responded to the posts created by the instructor.

Discussion and Conclusions

Student feedback revealed that some of the students who were able to attend the live sessions perceived the extra interaction and discussion with peers and the instructor to be beneficial in terms of participation and learning. However, the issue of inequality arises, as not all students were able to attend these sessions due to scheduling conflicts or other reasons. Although recordings were shared on the course site upon conclusion of each session, viewing a recording is not equivalent to having the opportunity to engage in live conversation with peers. Less than half of the students enrolled in the course were in attendance at the first synchronous session, and the number of students in attendance in the sessions decreased as the course progressed. Of note, students were able to enroll in the course even if they had a scheduling conflict at the time of the sessions, and were always offered an alternate assignment. As a number of students indicated they could not attend due to a time conflict, scheduling of the sessions to accommodate as many students as possible should be considered. For this course, sessions were always scheduled on the same day of the week at the same time. However, a greater number of students may be able to attend if sessions are scheduled on varying days and times. As students suggested, future courses could also experiment with more sessions of shorter duration. A 30-minute "crash meetup" could potentially be mixed with an alternate day of the week to encourage more participation. Alternatively, enrollment could be restricted to only those students who are available during the scheduled times for the sessions and attendance could be made mandatory. If it is decided not to offer synchronous

sessions to allow students greater flexibility, additional interactive opportunities that may be completed asynchronously may be added to the course.

Apart from difficulties in maximizing student attendance in the synchronous sessions, another issue that students frequently cited was lack of participation on the part of fellow students during the sessions. Many students, although attending the live session, still passively "sat around" and were not actively engaged. They did not type in the chat box nor use the microphone to talk to peers during the discussion in breakout rooms, which involved responding to a question related to the week's content. As a previous study suggests, the instructor must be proactive with regards to student participation during synchronous sessions (McBrien, Cheng, & Jones, 2009). To determine which students are not fully engaged in the sessions, it is possible to record the sessions and review the recordings to target those who may need additional encouragement. If there are a large number of students in the sessions, however, this may prove to be a challenge (McBrien et al., 2009). The presence of a few facilitators roaming from virtual room to virtual room to monitor as well as encourage participation may help in this regard. It is also important for instructors to build in technical training and support for students to reduce the negative impact of technical issues as well as to include opportunities to simulate face-to-face interactions. The lack of face-to-face human contact in the virtual classroom may increase the transactional distance, reducing students' sense of belonging and participation (McBrien et al., 2009). While instructors must strive to promote participation in the online classroom, students also share the responsibility for interacting online. One possibility for reminding students of the importance of participation during synchronous sessions may be to request that they sign a contract at the start of the course outlining their responsibilities as students in terms of online interaction. In addition, a point value could be assigned to the contributions students make during the sessions. Alternatively, each student could be assigned a role in a small group discussion session for active participation. For example, a facilitator is to make sure each member has equitable time to express his/her opinion, a timer is assigned to monitor the time limit, a recorder is assigned to quickly write down key discussion points, and a presenter is assigned to relay key points back to the whole class. By employing different interactive design strategies, students may become more engaged and involved.

Scholars in the field of online teaching have proposed some possible solutions to the above issues. The Phases of Engagement framework (Conrad & Donaldson, 2004) provides additional guidelines to increase student comfort in the online environment and promote participation. In the first phase, the instructor provides activities that help learners to get to know one another and feel comfortable in the online environment, such as icebreakers and a review of Netiquette rules. In the current study, while a review of how to interact using the Blackboard Collaborate system was included as part of each synchronous session, activities such as icebreakers were not incorporated, and these may have increased comfort levels for greater participation in subsequent sessions. In phase two, the instructor forms dyads of learners and provides activities that require sharing of ideas. Phase three involves activities in small groups, such as role playing and debates. In the final phase, activities are learner-led, and may take the form of group presentations or learner-facilitated discussions. Moving forward, to increase student participation during the sessions, it may be helpful to progress through these phases, requiring students to interact in different capacities, first using informal icebreakers, then in pairs, and finally in larger groups. As the semester progresses, varying activities related to each stage could be incorporated for variety and also to encourage participation.

In addition to live synchronous sessions, an outlet for interaction outside of the designated class times was recommended. Although a course Facebook group was created and students were reminded to join the group in the first week's module and the first two synchronous sessions, few students added themselves to the group, and no students created posts on the homepage. Given that this was an optional activity, it may be that students did not perceive the benefit in participating in the group in addition to all of the required activities in the course. It is also possible that students may not have wished to participate in the group due to the inclusion of the instructor as a member. Students also may not perceive Facebook as a useful tool for classwork-related purposes, and may believe the site is most appropriate for personal or social interaction. A previous study exploring student perspectives on the use of social networking sites for classwork found that most students were not particularly enthusiastic about the use of Facebook to connect with faculty and students (Roblyer et al., 2010). As several studies have demonstrated that use of social networking sites improves the learning experience by enabling

interaction, collaboration, active participation, resource sharing, and critical thinking (Mason, 2006; Selwyn, 2009; Tapscott & Williams, 2010), a second attempt to incorporate Facebook into a future course is warranted.

For future courses, it may be useful to create a Facebook group that is only for student use and observe whether there is greater student participation. It may be necessary to make this activity mandatory to ensure participation, and to provide students with specific activities that may be completed via Facebook to promote use of the site as an educational tool. Mazman and Usluel (2010) suggest that Facebook may be used for the following educational purposes: communication, collaboration, and resource/material sharing. With regards to communication, instructors may use it to facilitate class discussions, make announcements, deliver homework and assignments, and inform about resources and links related to the course. Facebook may foster collaboration by allowing students to carry on group works by sharing homework, projects, or ideas. Munoz and Towner (2009) suggest using Facebook as a course tool by posting podcasts, websites, and videos on the site, and using Google Documents to link students to study guides, PowerPoints, assignments, and tutorials. Instructors may also send messages to students via Facebook, post comments on "the wall" or chat with students during virtual office hours (Munoz & Towner, 2009). As some previous studies have indicated that students are enthusiastic about using Facebook to interact with friends, relatives, and classmates, positively influencing their perceptions of Facebook as an educational tool (Arteaga Sánchez, Cortijo, & Javed, 2014; Mazman & Usluel, 2010), further exploration of the acceptability and potential uses of a Facebook group for this course is warranted. While the course website currently allows for many of the aforementioned activities, it is possible that some of these may be able to be executed using Facebook instead. If it is found that Facebook is not the most appropriate tool to use in the course and is regarded as students' "personal" space, it is also possible to seek out other social media venues for interaction.

While the current study revealed the value of the interactive components of the online introductory nutrition course, a number of issues to be addressed were also discovered. Based on the current research, following are some recommendations for instructors who are interested in offering online science courses in higher education. Of note, there were relatively small numbers of participants in a single class in the current study, not all students participated in all live sessions, and not all students completed all surveys. Results and recommendations should be read with these limitations in mind.

1. Employ sound course design: It is clear from student feedback that flexibility, interaction, and instructor feedback were the features valued the most. These features are not unique to online courses. For example, an engaged instructor who is responsive to student needs is always essential. In other words, a good design is a good design regardless of online or face-to-face instruction. Instructors should continue to employ best practices when offering online courses.
2. Design for interaction: Some students prefer to "sit around" and just listen without offering their opinions. A variety of strategies may be utilized to encourage participation, such as: 1) Awarding points with a rubric detailing expectations; 2) Assigning roles during small group discussion; 3) Allowing flexibility in picking and choosing a preferred topic; and 4) Using interactive technology such as polling throughout a presentation.
3. Pay attention to technical demand: It is extremely frustrating to attend an online class and to face technical challenges such as a delay or computer crash. Students should be provided with ample tutoring and time to familiar themselves with the system and functions. In addition, the university should provide ongoing and real-time technical assistance to both student and instructor. Furthermore, alternative methods of communication should be offered to reduce anxiety. For example, a back-channel skype session could be offered while the class session is ongoing to offer on-the-fly support.
4. Be creative in course scheduling: One of the hallmark features of an asynchronous class is its flexibility, as reflected in student feedback in the current study. However, how may the balance between flexibility, allowing students to work on their on schedule, and engagement in synchronous meetings in which everyone needs to meet at a fixed time, be achieved? One option is to offer shorter sessions as brief as 30 minutes. Shorter sessions demand less time, are easier to fit almost everyone's schedule, and can be designed as a quick but effective meeting for review, discussion, and reflection. More sessions could potentially be offered on various days of the week to accommodate those who can never meet on a certain day. Of note, the current study

indicated that students may not always make use of such interactive opportunities offered. Another option is for instructors to offer the course entirely asynchronously, and incorporate interactive features such as discussion boards and activities to be completed using social media.

5. Accommodate different communication styles: While some students prefer verbal communication, others prefer a written format, as reflected in the current study. In light of the proliferation of smart phones and the use of text messages, it is possible to design the course to encourage peer interaction either verbally or in written format. One option is for the instructor to break students into groups by their preferred method of communication.

While students indicated that there was value in the interactive components of the online introductory nutrition course in the current study, potential for improvement still exists, particularly in terms of increasing attendance and participation in synchronous sessions. Future studies may examine strategies to address these issues and assess any changes in student perceptions and performance with greater online interaction.

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